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AIR TRAFFIC CONTROL TRAINING SERIES

CREW RESOURCE MANAGEMENT (CRM)

BASIC CONCEPTS

AT-M-06A

Purpose

This publication is for use in the awareness training of USAF air traffic controllers on basic CRM terminology and fundamental concepts. Designed to be a controller's first exposure to CRM fundamentals, it is not intended to replace, substitute for, or supersede official regulations, procedures, or directives.

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INTRODUCTION

Program Description

AT-M-06A (*Basic Concepts*) represents an introductory level (awareness) of knowledge that blends CRM knowledge, skills, and abilities into the ATC career field. The objective of AT-M-06A is to provide an introduction of basic CRM fundamental concepts and introduce standard CRM terminology to ATC. AT-M-06A is designed to be a controller's first exposure to CRM fundamentals. It is not limited to those of junior grades and should be utilized as a reference throughout a controller's career.

The *Basic Concepts* level of training is essential in order to facilitate a smooth transition to the next level of CRM training, *Supervisory Applications (AT-M-06B)*. *Supervisory Applications* centers around tower/radar facility-oriented training sessions, where controllers participate in group discussions/activities, role-playing, and exercises to develop strategies for dealing with seldom seen situations, incidents, or emergencies. Group participation and role-playing allows for the analysis of behaviors. Training sessions may be simulated, based on actual operational scenarios, or specifically designed for optimal circumstances to learn CRM knowledge, skills, and abilities.

The final level of CRM training, *Advanced Practices (AT-M-06C),* provides ATC supervisors lessons on advanced CRM topics, information on continuation training and feedback, and expanded terminology and knowledge. Emphasis is placed on developing a CRM evaluation program within a control facility, providing feedback to controllers, and using that feedback as lessons learned. The most important aspect of this component of training is the opportunity to reinforce CRM behaviors in the operational setting.

Application

Basic Concepts is an awareness training workbook that provides a controller with an introduction to the history and evolution of CRM, basic terms and definitions, and usable concepts that enable an individual to apply CRM philosophies into the work place. Crew coordination and teamwork have always been an integral part of ATC training though emphasis has always been on individual behavior. The assumption that crews composed of technically competent, well-trained individuals can perform safely and effectively as a team in a highly complex, rapidly changing environment has been the philosophy of the past. CRM has brought into focus the necessity for technically competent crewmembers to act as a team without diminishing the importance of highly skilled air traffic controllers.

CRM training is a requirement for Air Force aircrews and air traffic controllers. FAA Advisory Circular (AC 120-51B) and AFI 11-290, *Cockpit/Crew Resource Management Training Program*, outline general CRM principles and applications to use when building a training program. *Basic Concepts* follows guidelines set forth in these documents for initial training format and content. ATM-06A and subsequent documents are not directive in nature and creativity in developing local programs is highly encouraged. CRM training and development is in its infancy and will continually evolve as new equipment is sanctioned, procedures change, and air traffic controllers transition to an air traffic management role.

HISTORY OF CREW RESOURCE MANAGEMENT

Definition

CRM is a process designed to aid in the prevention of aviation accidents and incidents by improving crew performance through a better understanding of human factor concepts. It involves the understanding of how crewmembers' attitudes and behaviors impact safety, identifying the crew as a unit of training, and providing an opportunity for individuals and crews to examine their own behavior and make decisions on ways to improve controller teamwork. The Federal Aviation Administration (FAA) and the National Aeronautics and Space Administration (NASA) measurements of CRM-trained aircrews show that crews operate more effectively as teams and cope more effectively with non-routine situations than aircrews without CRM training. Considerable evidence has been accumulated over the last decade indicating that CRM training can and does change attitudes and behavior among flightcrews and that these changes increase the margin of safety in flight operations (Diehl, 1993; Helmreich & Foushee, 1993; Helmreich & Wilhelm, 1991).

Evolution of CRM

Investigations into air carrier mishaps since 1970 have shown that human error is a contributing factor in 60 to 80 percent of all incidents and accidents (National Civil Aviation Review Commission). It is the actions, reactions, and decisions of the individual that cause most accidents, not catastrophic failures of operating systems. Research at NASA has discovered that these events are attributed mostly to problems associated with poor group decision-making, ineffective communication, inadequate leadership, and poor task or resource management. Seldom do these situations have anything to do with the technical aspects of operating in a multi-person cockpit or an ATC operations area. In 1986, the Assembly of the International Civil Aviation Organization (ICAO) adopted Resolution A26-9 on Flight Safety and Human Factors. It stated that in order to improve safety in aviation, operators must be made more aware and responsive to the importance of human factors in aviation through proactive learning and from the reactions of others. As a result, the National Transportation Safety Board (NTSB) recommended implementing CRM training for crewmembers.

On December 16, 1973, a Ruble Airline DC-9 and a Northern Airline B-727 were holding over New York City while in direct contact with the appropriate ATC facility. The Northern B-727 was placed in a holding pattern awaiting clearance to land at New York's La Guardia Airport while the Ruble DC-9 was in holding to land at JFK International Airport. Both of the aircraft had been assigned the same altitude but were assigned to two different holding patterns that were safely separated. The Ruble DC-9 entered their assigned holding pattern at an excessive airspeed and flew outside the confines of their designated holding pattern airspace. As a result, they strayed into the airspace reserved for the Northern flight and eventually collided with it. One hundred twenty eight people on board the two aircraft died, as did eight on the ground. Ruble Airlines was blamed for the accident though a couple ATC observations were noted. The investigators determined the radar controllers should have detected the impending collision and issued corrective instructions to one or both of the aircraft.

Fictitious

Civilian airlines began CRM training by focusing mainly on decision-making models and communication techniques. As the benefits of aircrew interaction in operations were recognized, CRM training programs began to expand into personality issues, leadership, and team building. The first Air Force command to initiate a military version of CRM training for aircrews was the Military Airlift Command (MAC) in the mid-1980s. Almost immediately, other major commands began implementing their own mission specific versions of CRM training for their aircrews. In 1992, the Air Force capitalized on the mission differences between commands and the tremendous cultural differences between civilian airline pilots and military pilots and conducted it's first Air Force-wide CRM conference. The USAF steering committee was established at this conference to standardize requirements for developing, implementing, and managing all USAF CRM training programs for aircrews. This guidance was published as AFI 36-2243, *Cockpit/Crew Resource Management Program*, in 1994, and later changed to AFI 11-290, *Cockpit/Crew Resource Management Training Program* in July 1998.

Throughout the 1970's and 1980's, valuable research in aviation human factors was conducted by the FAA, NASA, the Department of Defense, educational institutions, and specialized industries leading to the inception of CRM into ATC. In 1988, Seattle ARTCC began a program called "Controller Awareness and Resource Training (CART)." The program emphasized certain CRM principles such as communications, teamwork, and the effect of human factors on ATC. Other FAA facilities soon developed similar programs. In 1992, the FAA's Air Traffic Teamwork Enhancement (ATTE) Steering Committee was established to assist facilities interested in initiating programs similar to CART. Over 150 air traffic controllers received ATTE facilitator training in 1992 and 1993.

From 1993 through 1995, the Air Force had three major aircraft mishaps that placed tremendous emphasis on expanding CRM concepts into the air traffic career field. Each mishap was attributed to human error. Although AFI 11-290 is not mandatory for non-flying occupations, HQ AFFSA, the AF Safety Center, and all major commands believed that the inclusion of CRM principles into ATC training would have distinct benefits.

The past 25 years of research and development on CRM has assisted the FAA in designing a very comprehensive training program for their controller cadre. Focusing on nine core concepts, the FAA requires CRM training during every phase of controller training.

Situational Awareness	Group Dynamics	Workload Management
Effective Communications	Risk Management	Stress Awareness
Mission Planning	Human Factors	Decision Making

CRM Core Concepts

CRM is not a new concept in the United States Air Force. Although CRM programs are mandatory for aircrew members and historically have been geared toward the operational flying environment, the potential exists to adapt fundamental program principles to any task or functional area requiring cooperative or interactive time critical efforts. Effective supervisors have utilized different core concepts at one time or another, not knowing that it is actually part of a formalized process. AFI 11-290 establishes the requirements for developing and managing CRM training programs. It encompasses theories and concepts that relate to any career field in the AF. The intent of this workbook is to combine the lessons

learned from daily operations with the research being conducted by the FAA and other research foundations to provide the air traffic controller with the necessary tools to operate effectively.

REVIEW EXERCISE

1. Crew Resource Management is a process designed to aid in the _____

_____ by improving crew performance

through a better understanding of human factor concepts.

2. Human error has accounted for _____ of all air carrier incidents

and accidents since 1970.

3. What was the first Air Force command to initiate a military version of crew resource

management training for aircrews? _____

4. In 1988, the Federal Aviation Administration implemented a program named _____

_____ _____ _____ _____

that proved to be the first CRM program for air traffic controllers.

5. List six (6) CRM core concepts.

_____ _____

_____ _____

_____ _____

6. What Air Force Instruction covers CRM in the United States Air Force?

_____

SITUATIONAL AWARENESS

Introduction

Situational awareness (SA) is the primary focus of CRM training. The loss of SA is the number one cause reported on all human performance related mishaps. Though many different definitions for situational awareness are available, the USAF/XO defines SA as "a continuous perception of self and aircraft (traffic) to the dynamic environment of flight, threats, and mission, and the ability to forecast, then execute tasks based on that perception." It is the accurate perception of current operations, other controllers, aircraft, and the surrounding world, both now and in the near future. Referring to the phrase "the big picture" best describes situational awareness in the ATC environment. When perception matches reality, a person is situationally aware.

Situational awareness involves integrating information received through many sensory channels (hearing, seeing, touching, etc.) over a period of time. The processed information forms a mental picture of the controllers location and a perception of the traffic environment. This picture is constantly updated as information becomes available. The ability to maintain SA is dependent on a controller's ability to accurately evaluate this integrated sensory data. Most often, individuals who have a deeper or broader knowledge and experience of ATC seem to integrate this sensory data easier. Should the information be inadequate, too much, misleading, outdated, or inaccurate, SA may be lost.

Situational awareness also involves interpreting situational *cues* to recognize a problem exists that may require a decision or action. Individuals and crews must go beyond merely noticing the presence of *cues*; they must appreciate and assess their significance. Doing so successfully depends on the knowledge and experience gained in similar situations. Refer to the example below.

> Recorded weather information is available to all controllers at each operating position. Noticing that there is less than a 5 degree spread between temperature and dew point usually means that fog is likely to occur, although there may be no mention of fog in the report, and should be cause for concern. An alert controller, watch supervisor, or crew will recognize this potential problem (situational cue) for aircraft and seek further information. Less experienced or knowledgeable controllers may not cue in on a circumstance such as this.

Recognizing and defining the nature of a problem encountered in an operational environment, such as ATC, is the first and perhaps most critical step in making an effective and safe decision. This concept is known as "detection and correction". If a controller or crew does not realize they have a problem, they are not going to begin trying to solve it. Unfortunately, problems have a way of evolving and by the time less sensitive controllers or crews are aware that a problem exists, the situation may already have evolved into a much more complex scenario. Sometimes cues are subtle and do not signify a problem at the moment, but forewarn that conditions may deteriorate in the future. For example, a heavy rain front east of the airfield may cue a crew that a weather front is moving in to their area. This may lead them to consider the possibility of an aircraft going missed approach if the weather drops below minimums. Situational awareness allows crews to mentally plan ahead and prepare for contingencies.

Integrating data available into an accurate mental picture of the current air traffic environment is based on a myriad of inputs. For example, the local controller bases control decisions on data received from a

mental picture. This mental picture is formed using (audio) inputs from the tower coordinator, ground controller, flight data controller, watch supervisor, the SOF, a trainee if in position, other controllers, alarms on equipment, and the pilots. A controller may receive (visual) information relative to the traffic environment from observing aircraft positions, flight progress strips, note pads, grease pencil data on plexiglas, wind indicators, AWDS, DBRITE data (full or limited), other controllers (non-verbal signals), request/acknowledge system (302A), position checklists, aircraft landing lights, etc. All sensory data impacts individual situational awareness.

Loss of Situational Awareness

Errors in maintaining situational awareness can be as simple as not receiving information, failure to perceive information, improper comprehension of information, or an inability to project actions (control decisions) into the future. Judgment, based on situational awareness, is the total mental process used to arrive at a decision. The ability to make a correct decision is dependent on the acquisition of appropriate information, accurate assessment of the information, accurate judgment of the probability of events, and risk assessment based on the three previous elements. Accident data suggests that most mishaps result from a series of poor decisions, which may be called the poor judgment chain. Research also shows that each error leads to an increase in workload (to rectify the error). One faulty decision increases the probability of another and as the poor judgment chain grows, the probability of a mishap increases. The following are some symptoms of lost situational awareness.

1) Fixation on emergencies, your assistant or crew member, equipment alarms, etc.

2) Ambiguity when questioning display data (Full data block, limited data block, coast targets, etc.).

3) Two independent sources disagree and remain unresolved.

4) Complacency "I've done or seen this a hundred times....".

5) Gut feeling/confusion when the subconscious is putting out a warning.

6) Feeling good, everything is just perfect, everything is going too well.

7) Poor communication or slow to respond.

8) Failure to meet operational tasks, i.e. late breaks, late or forgotten base leg turns, failure to see point-out or hand-off requirements or discrepancies, etc.

9) Improper procedures, i.e. deviations from FARs, FAAO 7110.65, or checklist procedures.

10) Unresolved discrepancies, i.e. conflict alerts, low altitude alerts, MSAW, TCAS alerts, LLWS.

11) No one separating the aircraft; everyone involved with other tasks.

Manifestations of these individual indicators or threats may be subtle and difficult to pick up. This is especially true when an entire crew is fixated on a particular situation, or when complacency has taken over due to low traffic volume. In order to recognize specific indicators pointing to loss of situational awareness, it is important to become familiar with its causes and its threats.

Recognizing Lost Situational Awareness

Recognizing if situational awareness has been lost is a very important element in CRM. If any of the indicators erupt within the crew, make an assertive statement to stop the flow of events, and then closely examine the traffic situation. The goal is to regain situational awareness in the control environment. It is important to:

➢ Verbalize Concern
➢ Stabilize Conditions

➢ Brief Future Impact
➢ Debrief When You Can

Causes/Threats to Loss of Situational Awareness

Attention Threats - Attention problems that hamper or prevent proper situational awareness. They occur when the conscious level of awareness is distracted, when too many tasks are present to manage, or when the controller fails to monitor the environment.

Task Saturation - Task saturation occurs when a controller has too many duties or sub-duties to attend to at one time. The ability for a controller to successfully manage multiple tasks will vary day-to-day, depending on the psychological (mental) and physiological (body) state of the individual.

Distraction - Distraction is the interruption of conscious attention to a task by a nontask-related cue. A controller may be distracted by external cues (noise, lights, visitation tours, etc) and internal cues (marital problems, financial problems, desire to excel, etc). Distraction is good if conflict alerts, low altitude alerts, or any other safety feature is distracting the controllers attention towards a potentially more important task. Thinking about a personal problem or reaching for the phone to take a personal call will endanger aircraft operational safety by taking the controller from an important task.

Channelized Attention - Channelized attention means focusing on only a limited number of environmental cues while excluding other cues of possibly higher or more immediate priority. Mishap investigators have identified channelized attention as the number one human performance factor causing a loss of situational awareness.

Inattention - Inattention occurs when a controller is under-challenged. As a result, there is not a conscious effort to monitor the control environment. The appropriate level of attention is not dedicated to the task or situation. This can happen at any time. Some examples of inattention are working the early morning dayshift before the major departure flow begins, or after a heavy recovery and the crew takes on a very relaxed posture.

Habituation - Habituation is the adaptation and subsequent inattention to a cue or warning sign. Habituation can occur when there's a high workload, a change in the operating position layout, or a lack of recent experience (leave, TDY, DNIC) resulting in a wrong prioritization of cues. Additionally, if the same task has been reaccomplished several times, such as clearing an aircraft to land, the controller may mentally remember having cleared the aircraft without actually doing it.

Negative Transfer - Negative transfer results when something is learned so well that it is performed at a subconscious level; however, in a new or different situation, the old response is inappropriate. For

example, negative transfer may result when changes occur in strip-marking or phraseology for issuing traffic, or the facility switches to a seldom used runway (other than the primary runway) and all the radar headings change for vectoring aircraft in the radar pattern. In addition, during high stress situations, when unusual situations occur, the controller would "instinctively" know what to do but negative transfer delays control actions and the human error chain might be initiated.

Inappropriate Motivation - Motivation is the rationale or incentive for a person's actions, the driving force that compels an individual to meet their goals. Problems arise in the air traffic environment when personal motivation is not consistent with the goals of the crew or facility (inappropriate motivation) and can be exhibited in several ways.

Pressing - Pressing refers to placing unnecessary demands on you or crewmembers beyond known capabilities or limitations. It's a type of risk-taking in which achieving the goal is perceived as worth the risk, even though the controller knows the chance of successfully completing the task is questionable. Often the goal is a personal one and inconsistent with normal facility procedures or crew policies. For example, facility procedures call for runway operations to be suspended after an emergency. The crew's

On 12 July 1994, a near mid-air collision (NMAC) occurred between a T-37 and a T-38 on final approach to runway 21 at Grant AFB, USA. At the time of the incident there were four aircraft operations: a transient T-38 was on an instrument approach; a KC-135 had just landed; a T-37 was established on outside downwind approaching a five-mile reporting point for a visual straight-in, and; another T-37 was on initial for the visual overhead pattern. Upon landing rollout the local controller (LC) cleared the KC-135 to perform a 180° turn on the runway to back taxi to the exit. At the same time the flight data controller (FD) received an inbound call from Grant Approach Control, informing them of a T-38 on a nine-mile ILS final to runway 21 (*human error chain initiated*). The Grant Letter of Agreement (LOA) states that Grant Approach will report traffic inbound to Grant tower no later than 12 miles out, and will transfer communications and control to Grant tower no later than 10 miles out. The FD controller relayed the inbound information to the LC, but did not state the exact position of the T-38 (*ineffective intra-facility communications*).

The T-37 at the initial break point was cleared to break. The T-37 on an outside downwind reported at the five-mile point and was cleared for the visual straight-in. During this time the LC scanned the BRITE II radar for conflicting traffic on final. No traffic was observed. The T-37 in the overhead reported gear down and stated that they would be going around for the KC-135 on the runway. The first position report and initial check-in attempt by the T-38 crew came at an approximate eight mile final, but was blocked and garbled by another aircraft checking-in with tower. Shortly thereafter, the T-38 reported "inside the final approach fix gear down." Not having the T-38's position in mind, the LC was caught off guard (*loss of situational awareness*) and asked the T-38 to repeat himself. The T-38 did so and was cleared to land. At this time both the T-37 on the visual straight-in and the T-38 on the ILS were converging (*loss of situational awareness*). The T-37 was rolling out on a three-mile final and was unable to report gear down due to another aircraft reporting in with the tower. Neither the T-37 crew nor the T-38 crew saw each other and continued as previously cleared. The supervisor of flying (SOF) brought the conflict to the attention of both the LC and T-37 at 1.25 miles on final. The T-37 crew reported that the T-38 came within 100 feet of their position, however separation was already lost as the T-38 had already passed the T-37 aircraft, continuing beyond them and through their glidepath. With the KC-135 still on the runway, the T-38 queried tower on his landing clearance. Now having the conflict in sight, the LC directed the T-38 to climb to "initial" at an altitude of 2,600 feet. The T-38 executed a go around and stated to the tower that they were unable to climb as requested due to the other T-37 on the go in front of him. Eventually the T-38 was directed to return to approach control for another radar pattern. The T-37 on short final reported gear down and was cleared to land.

policy is to provide a smooth and safe service and take aircraft delays when necessary as directed in the base flying regulation. A controller, through personal motivation or a need to maintain a reputation, may attempt to squeeze in a couple more landings prior to the emergency aircraft landing. This risk is powered by personal motivation and is usually self-serving.

Misdirected peer pressure - Misdirected peer pressure is based on controllers typically being competitive and aggressive. When these personality traits are inconsistent with safe performance of ATC, it is neither appropriate nor professional. Attempting prohibited operations because of a dare or disregarding regulations to impress other controllers are deadly examples of misdirected peer pressure.

Supervisory pressure - Supervisory pressure that compromises safety negatively affects operational effectiveness. Watch supervisors would rarely pressure a controller to intentionally compromise safety. However, situations will arise where a controller may feel intimidated by the supervisor, resulting in an unsafe situation. Crew personnel have a responsibility to point out any dangerous situation to the supervisor, and if unresolved, to the chief controller. A supervisor can display positive characteristics of supervisor pressure. Positive supervisory pressure is intended to elicit the best efforts from subordinates. Some methods are setting good examples and providing constructive motivation.

Multiple technique input – Multiple technique inputs are the result of too many controllers interjecting their personal method of controlling traffic. It is very common when a trainee is in a control position. The trainer advises the trainee to do things one way, the coordinator another way, and the watch supervisor yet another. The trainee is forced to maintain operational situational awareness while at the same time listen to multiple inputs from crew personnel.

REVIEW EXERCISE

1. The primary focus of crew resource management is _____
_____.

2. What is the most critical step in making an effective and safe decision in an ATC environment?

_____
_____

_____
_____

3. A series of poor decisions is known as the _____ _____
_____.

4. Which cause/threat to situational awareness involves a controller focusing on only a limited number

of environmental cues?
_____

5. Which cause/threat to situational awareness involves placing unnecessary demands on crewmembers

beyond their known capabilities and limitations?
_____

6. Using the example in the text, answer the following question: The local controller focusing on the

KC-135 back taxiing on the runway is an example of what?
_____

_____
_____

7. "Been there, done that, piece of cake" is what type of verbal indicator of loss situational awareness?

_____
_____

EFFECTIVE COMMUNICATIONS

Introduction

Effective communication is very subjective. At times, individuals do not communicate at all, sometimes not enough, and most often, communications are performed wrong. Controllers generally believe they are excellent communicators, as daily rigors require abundant amounts of personal and professional communications. This paradigm creates a challenge; how can we enhance our environment and improve communication skills when the community as a whole doesn't believe there is a problem?

CRM communication training is dedicated to addressing this challenge. By illustrating examples of good and bad communication behaviors, controllers will take a closer look at individual communication styles and habits. Whether an individual is a line controller, watch supervisor, or chief controller in a tower or radar facility, controlling capability is directly related to the individual's ability to communicate ATC instructions in an effective and timely manner.

Though controllers often take effective communication for granted, basic communication theory and accident investigation reports infer that there are many factors on both the sending and receiving ends of a message that affect how well we communicate. Translating theory and recommendations into comprehensible and usable information is difficult. It often renders the information useless and incomplete. The goal of this lesson is to provide the controller with communication tools that will assist the controller in knowing when to communicate, how to communicate, and what pitfalls to avoid.

Communication Responsibilities

In addition to regulatory responsibilities, controllers must establish an environment that promotes the free flow of information throughout an IFR room or control tower. Crews must become skilled at expressing disagreement (when appropriate) without making other controllers feel personally rejected or ignored. Each crewmember should involve every controller in the communication process and make an overt effort to keep the crew informed as situations progress. Responsibilities are not limited to specific individuals or control facilities. Effective communication with other mission elements (FAA facilities, Base Ops, Weather, Command Post, SOF, etc) is vital to both the communication process and the safety of flight. Communication feedback, both positive and negative, is a necessary responsibility as it emphasizes the effects of specific incidents and progressive trends. Feedback is normally addressed during pre-duty briefings, de-briefing sessions, and during position relief.

"The biggest enemy of effective communication is the illusion of it."

Communication Errors

One of the most significant variables relevant to controller performance is the information flow within the air traffic facility and between the air traffic facility and other agencies (i.e., Base Ops, FAA TRACON, FAA Center, Command Post, and Weather). The effective transfer of information is a complex process, and requires that information be conveyed when needed, transferred clearly, attended to, understood and acknowledged by the receiver, and clarified if needed. There are numerous opportunities for breakdown in this process. A six-year study of aviation accident records revealed that crew coordination failures directly contributed to 147 aviation fatalities. Analysis of these accidents revealed that 41 percent of the

crew coordination errors related to a breakdown of communications between crewmembers. Though the study was conducted within the pilot community, the analysis exemplified the same breakdowns in communications experienced in the ATC environment.

The AF Safety Center, NASA, and the FAA maintain a historical database of aviation incidents. Seventy percent of the archived mishap reports reveal common deficiencies in the transfer of flight information. Of these, 37 percent were attributed to the failure of the pilot or controller to speak up (volume, confidence). In the majority of these incidents, the necessary information was communicated, but was not made available to the rest of the crewmembers. Thirty-six percent of the findings were categorized as communicating inaccurate, incomplete, ambiguous, or garbled messages. Additional factors included the failure to transmit the message at the appropriate time (13 percent), the message was either not received or was misunderstood (11 percent), and information transfer problems attributed to equipment failure (3 percent).

$\Rightarrow$ Problems dealing with poor understanding
$\Rightarrow$ Lack of appropriate acknowledgments
$\Rightarrow$ Extraneous conversations between controllers in and outside the facility
$\Rightarrow$ Information not successfully transferred between controllers
$\Rightarrow$ Lack of confidence causing new controllers not to speak up when situations arise
$\Rightarrow$ Overconfidence or complacency

Analysis of ATC Related Communication

Inhibitors to Effective Communication

Communication errors that do not involve equipment malfunctions exist in one of three communication components; the sender, the message, or the receiver. The sender initiates the sequence of communication and is responsible for the initial accuracy of the message. The message is the communication transmitted between the sender and the receiver. The receiver attends to accepting and understanding the message. Since communication is a two-way process, the receiver has a major responsibility in assuring an effective communication.

Communication barriers can occur within and among each individual component. Miscommunication by the sender can occur due to a variety of reasons. The most abusive is when individuals possess hidden agendas and intentionally withhold information. Though not common place in most control facilities, supervisors and line controllers must be aware of the possibility of it occurring. Wording is another infraction often committed by the sender of a communication. For example incomplete wording ("your point-out is approved reference my traffic"), ambiguous wording ("this ain't going to work", or, "turn him"), and the use of jargon (radar jargon versus tower jargon) render even the slowest of traffic periods hazardous. Additionally, distractions (equipment alarms, background noise) occurring while the sender is trying to communicate will inhibit the intent of the message.

Regardless of abilities of the sender, the message can often be vague, overly complex, or difficult to interpret or remember. Most message misinterpretations occur due to the result of regulatory violations. For instance, not complying with phraseology standards set forth in FAAO 7110.65. Noncompliance can

be as subtle as improperly acknowledging a clearance or control instruction from another controller ("OK", "Thanks", "No Problem") to using partial cal signs ("81" versus "Hawk 81") or responding incorrectly to a request or advisory ("Roger" versus "Wilco").   In any case, the potential for misinterpretation is very high and creates an environment for an unsafe aircraft operation.

Active listening involves hearing (physically), interpreting, evaluating, responding, or asking for clarification if a communication is unclear. The receiver must practice effective listening skills on a continuous basis in order to complement sender and message effectiveness. To be an effective listener, an individual must follow simple, specific guidelines. For example, suspend premature judgment during a conversation. Don't assume you're going to hear what the pilot or controller is expected to say. Listen with an open mind. Hear, interpret, and evaluate all input.   Respond immediately to pilot and controller requests and statements, even if "standby" is the only response the controller is able to give. Note verbal and nonverbal cues (body language, facial expressions, etc.) of other controllers.

Other barriers exist that may also block, distort, or change the meaning of a communication. Physical barriers such as background noise, headsets/hand-held phones, PIDP keyboards, FDS keyboards, or multiple/simultaneous communications can inhibit pilot controller interaction. Nonstandard phraseology such as stating "tight on gas" versus "emergency fuel" may also inhibit effective communication. This specific miscommunication has occurred more than once in aviation history resulting in the deaths of many individuals. Cultural language differences are common place in ATC. Dialects from different parts of the country (i.e. New York versus Alabama) can usually be overcome by controlling the rate and pitch of speech. Serial distortion occurs when the message gets distorted while being passed from one person to another. For example when a pilot relays a request to the command post, who relays it to the SOF, who relays it to the tower watch supervisor, who relays it to the RAPCON watch supervisor, who relays it to the CI, who relays it to the approach controller.   The margin for error increases with each agency involvement.

> Several years ago a T-38 student on a cross-country check-ride was told by the tower to "continue holding short of the runway." The student promptly lowered the canopy and pulled onto the runway to begin the line-up checks. When questioned by the tower as to what he was doing, he replied "roger, cleared for takeoff." The instructor pilot took control of the jet and returned to the hammerhead to await proper clearance. After questioning the crew, it was discovered that the student had never been in a situation where he had been told more than once to hold short of the runway. After being told to hold short, the next call the student was conditioned to hear was "cleared for takeoff." In this instance, the student heard what he was conditioned to hear, without actively listening.
>
> *Don't hear what you want to hear, hear what is said!*

Promoting Effective Communication

Pre-duty planning time may be the best time to establish a free flow of information between crewmembers while everyone is totally devoted to preparation. Any contingency discussion done prior to working in the facility will improve reaction time during the actual operational execution. Avoid over-criticizing other controllers on their communication skills. While a good debriefing is certainly helpful, excessive criticism can actually lead to reduced effectiveness in communication. Concentrate on self-improvement. Effective communication can also be promoted by practicing precision. Pass the maximum amount of information using the least words at the best time, to whomever needs it the most (it may not necessarily be the pilot).

Speaking when an individual has the time and asking the right questions is known as preemptive communication. During preemptive communication, practice *assertion, advocacy,* and *inquiry* communication skills during both pre-duty and debriefing sessions to reduce the unknown to a minimum. *Assertion* is actively stating or passing on applicable information required when accomplishing a given task. A lack of assertiveness by controllers may be a cause of poor communication transfer. *Advocacy* is an obligation to speak out assertively to support a course of action while remaining open to opposing viewpoints. Many individuals confuse advocacy with criticism. *Inquiry* is a process of actively seeking information from all available resources and is a form of constructive skepticism that helps to overcome complacency. The watch supervisor has total control of the communication process during the shift. If attempts to communicate are stifled or reprimanded, controllers will immediately terminate the process, and information flow will be at a minimum.

Effective Communication Behaviors

Effective communication is not a natural function in ATC. It requires practice, skill, and the use of all available support equipment. Controllers who display good communication behaviors tend to be more operationally effective. When information is transferred clearly (accurate and timely), there are not only fewer errors, but less potential for errors not related to effective communication. The following example represents a small list of effective communication behaviors necessary for operational success.

Convey information clearly, concisely, and in a timely manner.

Use standard terminology, phraseology.

When using automated communication procedures or manual/automated strip marking, follow SOPs.

Advocate concerns and suggestions clearly and assertively. *Remember, only when necessary.*

Acknowledge all communications face-to-face, by voice media, or through equipment automation.

Provide information as required.

Repeat information, only if necessary.

Ask for clarification when needed.

Resolve conflicts constructively and timely.

Effective Communication Behaviors

Asking questions is an important element in CRM. This not only applies to communications between controllers, but also to operations within the facility. A well-structured checklist forces controllers to ask questions about specific operations or events. Reviewing approach charts, facility operating instructions, and ready reference files is another questioning technique. Discussions pertaining to unusual incidents or situations will prompt controllers to utilize critical thinking skills, and ask questions that identify possible solutions or procedures.

Part of being an effective air traffic controller is possessing strong opinions on how to handle different operational situations. Crewmembers should be encouraged to provide opinions confidently and respectfully, not in a manner that would impede current operations. Supervisors must ensure that

everyone is given an opportunity for rebuttal, discussion, and that the crew forms some sort of consensus on the specific topic.

Get attention/say name/operating initials or facility sector - "East Radar, West Radar on the 52 line".

State concern - "I'm concerned about.."

State problem - "...the barrier is still up."

Offer solution - "...we should consider parking him on the de-arm pad."

Obtain agreement - "...what do you think?"

Opening the door for further discussion

It is important not to confuse opinions with controller technique. Part of controller effectiveness is the ability to be autonomous while staying within operational guidelines. Consider controller opinions the net result of career-long training and experience. When opinions are offered constructively, they can be priceless. If ignored, the results can be disastrous.

One major and pervasive compromise to operational effectiveness and ATC safety comes from authoritarian controllers, trainers, and watch supervisors who cannot or will not consider other opinions. This attitude has led to much controller ineffectiveness and usually results in crew contention and individuals taking sides. Watch supervisors need not relinquish authority when line controllers voice concerns. Trainers are not less effective when trainees become involved in the learning process. Controllers do not lose their professionalism when others provide input. Total crew performance and decision-making processes are enhanced when the talents, experience, and assets of an entire crew are utilized.

REVIEW EXERCISE

1. Communication _____ is a necessary responsibility since it emphasizes the effects

of specific incidents and progressive trends.

2. What percentage of aviation incidents are attributed to common deficiencies in the transfer of flight

information?
_____

3. The most abusive type of miscommunication occurs when
_____

_____
_____

4. A malfunctioning headset and a hard to reach FDS keyboard are examples of
_____

barriers to effective communications.

5. The _____ _____ is the best time to establish a free flow
of

information between crewmembers.

6. Actively stating or passing applicable information required when attempting to accomplish a given

task is known as _____.

7. Who has total control of the communication process during a given shift?
_____

_____
_____

8. Effective communication behavior requires all communications to be relayed _____

_____, _____, or through
_____.

9. True or False (Circle One). Crewmembers should not be encouraged to provide opinions during

flying operations. Only the watch supervisor is allowed to provide inputs into the decision making

process.

10. A controller who does not listen to or consider other controller opinions is known to be an _____

_____ type controller.

GROUP DYNAMICS

Introduction

Group dynamics, as related to CRM in ATC, encompasses many concepts and philosophies though focuses around leadership. It involves command authority, responsibility, assertiveness, behavioral styles, and team building. In ATC, the effectiveness of the group (crew) is totally dependent on the strength of individuals. Herein lies the paradox; how does a group set in a hierarchical institution, act as individual leaders, with shared responsibilities in a technical capacity, while dependent on each other in the operational environment?

The concept of group dynamics and team concepts has gained more attention in ATC as automation has replaced many of the mechanical reasons for aircraft accidents. Many questions are being asked such as why (not how) a properly qualified, highly trained, medically fit professional failed to perform a task as expected. Is the group at fault, or the individual? How does a career totally dependent on highly technically, skilled individuals, infuse liberal behaviors such as team building into the work environment? The solutions are endless though basic principles apply that are inherent in the process.

Leadership

At the heart of CRM is effective leadership.

Leadership is a complex process and a significant factor in a crew's success or failure. A leader in a given situation is a person whose ideas and actions influence the thought and the behavior of others. Leaders are an agent of change and influence (both positive and negative), using examples and persuasion combined with a personal understanding of the goals and desires of the group. Leaders must be able to contribute to solving problems of the group, whether directly or indirectly.

Strong and effective leadership creates high crew involvement and shared commitment to overcome obstacles as a team. Leadership is not about leaders in a vacuum; it is about leaders in relation to followers in a particular setting. Every team must have leaders and followers. Each member of the crew must recognize that he/she has a leadership responsibility that is important to effective decision making. No matter which position a controller occupies in the control facility, they must learn to become a leader in that position. Leadership is a group phenomenon. To be an effective leader, general concepts and applications are inherent regardless of what environment a controller is in.

The Air Force provides regulatory guidance for ATC crewmembers authority and leadership. AFI 13-203, *Air Traffic Control,* is the source of watch supervisor, senior controller, controller, and trainer authority. Their personality and support from facility management determine how crewmembers share responsibility. Facility and crew staff must enlist others to implement guidance and enhance their individual authority. The extent and method by which other crewmembers strengths are utilized is determined by various leadership styles.

Leadership Characteristics

Everyone possesses leadership traits and characteristics. Some individuals appear to have a greater degree of these characteristics than the average controller does, and often become an informal leader

during periods of low traffic or while off-duty. Since leadership is dependent on the situation, some individuals may display leadership abilities during unusual or hectic situations while displaying more followership traits at other times. Regardless of the individual or the situation, the same personal traits and characteristics emerge during leadership challenges.

- *Competence* – Mastery of ATC must be displayed continuously and efforts should be made to inspire confidence in other crewmembers.
- *Communication Skills* – Leaders must inspire individual and group confidence.
- *Listening Skills* – Leaders listen. They interpret and evaluate what they hear, and do not permit personal ideas, emotions, or prejudices to distort what a person says.
- *Decision-Making* – An effective leader is skillful at problem analysis and decision making and seeks out all pertinent information when arriving at a decision.
- *Decisiveness* – Followers will usually excuse almost any stupidity, indiscretion, or ill-conceived action, but they will not accept excessive timidity.
- *Perseverance* – Controllers who aspire stick to tasks and see them through to completion, regardless of difficulties. They are optimistic and confident they can find solutions to problems.
- *Sense of Responsibility* – Leaders place responsibility above personal desires.
- *Emotional Stability* – Leaders exercise self-control if they expect to control others and must maintain control in the most trying situations.
- *Enthusiasm* – Followers will automatically give of themselves and take pride in their work when they know their leader is involved and committed.
- *Image* – Leaders must have a positive self-image.
- *Ethics* – Leaders must maintain a high standard of personal conduct and adhere to those standards in all situations so followers can rely on the leader's actions. Leaders must not use their position for personal and special privileges.
- *Recognition* – Leaders are aware of the accomplishments of others on their crew; they know each person's name, hometown, family situation, and so on. They are aware of the feelings of others.
- *Sensitivity* – Leaders must be aware of their own and others psychological and physiological states and be sensitive to the impact they have on others.
- *Flexibility* – Leaders must understand that no two people situations are ever exactly alike.
- *Humor* – Humor is a positive contribution to an efficient and effective control facility.
- *Stamina* – Leaders have a high level of physical and mental stamina. They know how to pace themselves well and maintain themselves in good physical condition.

Note: AFI 13-203 and FAAO 7110.65 clearly establish the roles and responsibilities of ATC crewmembers. The training material presented in this guide in no way degrades, detracts, or overrides that authority.

Conflict Resolution

If each individual in a control facility advocates his or her respective position properly, conflict is inevitable. Therefore, an effective process is needed to resolve those conflicts. Conflicts are not necessarily bad as long as they arise over issues within the control area. They become destructive when issues from outside the control area are brought into the disagreement such as taking sides on management policies, personality factors, personal weaknesses, social status, and so on. It can also be destructive when the

argument is over who is right rather than what is right. Such arguments can have a serious effect on the quality of the decisions made because they focus attention on irrelevant issues.

Conflict can be very constructive if it is handled properly. The following practices can help resolve conflicts with positive results:

- Encourage others to express their opinions.
- When disagreement arises, keep the discussion on the issues needing resolution within the control facility.
- Conduct formal debriefs as often as necessary.
- Bring out all issues of disagreement.
- Acknowledge and express all feelings that are deep enough to cloud thinking. Colleagues should know why each controller feels so strongly about an issue.
- If a disagreement arises that becomes too argumentative to solve and control aircraft simultaneously, debrief at another location when traffic has decreased.

Properly handled, conflict resolution is fundamental to good problem solving. It leads to deeper thinking, creative new ideas, mutual respect, and higher self-esteem, all of which strengthen team effectiveness. For these reasons, conflict should not be avoided when differences of opinion arise. Rather, it should be recognized as an opportunity to seek better solutions that may not have been thought of previously.

Team Building

Effective controllers possess many of the same personal traits: effective communication skills, sound judgment, job knowledge, the ability to accept criticism, and mental/physical skill. An effective leader must maintain these same skills and capitalize on the personal traits of others. Through integration of individual personality strengths and weaknesses, a sound leader is able to create an effective team built on synergy. Even though controllers are trained to be effective as individuals, control facilities cannot survive without team continuity.

The art of good team building is developing a cohesive group where both leadership and followership are critical to operational effectiveness. Learning teamwork is often difficult as a controller because virtually all the formal training and experience is as an individual. This strong emphasis on individual performance may, at times, be detrimental to effective team effort because there has been no experience of sharing responsibility for making decisions and taking actions. However, when an incident occurs, the crew is evaluated as a team – they survive together or they go down together.

Team building will occur without effort in a normal group environment when a common cause is at hand. To enhance the process, each controller on a crew can be open to certain characteristics and group dynamics. As more individuals become positively group oriented, others will be influenced, and changes in attitudes and behaviors will occur.

Hazardous Attitudes

Leadership and followership in communication can be a difficult quality to measure. It would be unfortunate to avoid the subject for the lack of mathematical precision. Positive and hazardous attitudes play a role in communication problems. Definable actions (roles and attitudes) do contribute to the well-

managed control facility, and while it can be uncomfortable to evaluate your personal shortcomings, it can be worse to ignore them. Every good leader is a good learner.

Controllers tend to learn more from their mistakes and the mistakes of others than from the many noteworthy efforts displayed each day in a control facility. As individual controllers and crews mature, positive and negative attitudes and behaviors surface forcing the crew as a whole to either accept certain forms of behavior or extract them from the crew. Most often these behaviors display themselves as hazardous attitudes, and may be behavior indicators leading to team degradation, performance incidents, or mishaps and/or Hazardous Air Traffic Reports (HATRs). The entire crew must be aware of the hazardous attitudes, confront them, and attempt to correct or nullify them. Attitudes and behaviors are the cornerstones to group dynamics, and pave the way for team building and continuity. Examples of hazardous attitudes include:

Excessive Professional Deference - This example refers to controllers being hesitant to call attention to deficient performance in others, particularly if they are senior to us. Therefore, even when one crewmember points out performance which is outside of established parameters, it is typically done with vague corrective instructions. For example, watch supervisors may inform ATC staff members their phraseology is a little off or a little fast, no matter how bad or far off the mark it may be.

Halo Effect - The halo effect occurs when an individual with a significant amount of experience in one type of facility PCS's to your facility or is re-assigned to a specific crew. "I've heard this guy is *really* good" "Everyone says this guy is the best." Typically, that crewmember is given preferential treatment and accelerated training and certification in either the new facility or position. The rationale used by other controllers is that this person has so much experience at their last base, they must certainly be able to handle the traffic here." The halo of expertise blinds everyone to the major differences between facilities or crews and the need for a more extensive training program.

Spectator Syndrome - The spectator syndrome is based on a comforting premise that one or all of the crewmembers have the situation under control and are looking out for your best interests. "He'll catch it if I screw up, after all, he's more qualified than I am and it's his ticket." It can be experienced by any crewmember, and though it directly affects rated and supervisory personnel, it has a detrimental effect on the entire facility.

Strength of an idea or traffic "game-plan" - The big picture continually changes in an ATC environment. A controller's first idea may not necessarily be the only one or the best one. When it dominates a controllers thoughts and actions, it decreases situational awareness through channelized attention.

Inability to accept criticism – Controllers will naturally give criticism and try to accept it. "Who is he/she to tell me it's not going to work?" The inability to bounce back from criticism creates a bigger problem than the criticism itself. Once the comment is made, controllers tend to focus on the statement or are embarrassed instead of looking at the situation.

Airshow syndrome - During unusual traffic scenarios, controllers sometimes perceive pressure to control aircraft beyond their real capabilities. This pressure is usually self induced, though may come from motivational accolades from staff members to do the best job possible. "This is my chance to be a star".

Impulsiveness – An arbitrary decision to perform a control action without weighing the consequences.

Animosity - Fear of causing hostility by challenging actions.

Know it all - Readily departing from or ignoring standard operating procedures and instructions.
Intimidation - Controller or supervisor ignores inputs, or belittles suggestions. Other controllers feel their inputs are not meaningful and will delay or stop operational inputs.

High workload - Task saturation results in tunnel vision and little or no crew communication.
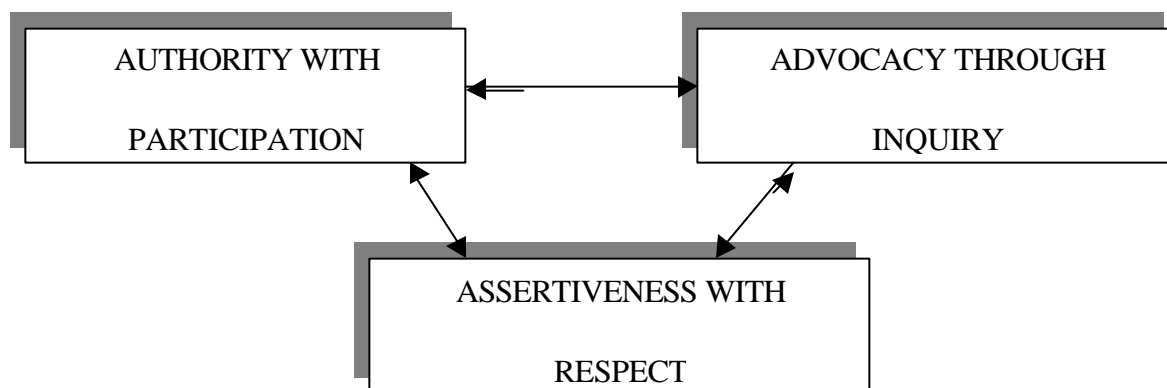
Low workload or complacency - Boredom sets in resulting in inattention.

Emotional jet lag - Mentally focusing on an error that was made while the traffic flow continues to move or build. Situational awareness and the ability to resume control decreases.

Assertiveness in a Group Environment

Effective advocacy is an important part of the communication process in a control facility, though the most difficult to perform. From a controller perspective, it is every controller's obligation to speak out in support of a course of action different than that planned or being followed? It involves listening to points of view that may be contradictory to yours. It equates to teamwork, allowing every person in the control facility an opinion.

Assertiveness is the act of stating something so it is received in a positive manner.   Effective assertive behavior is difficult for everyone (especially controller's) to be on the receiving end of since criticism is usually perceived negatively and rendered without forethought. The following diagram illustrates three examples of effective assertiveness and advocacy:

```
  ┌──────────────────┐                      ┌──────────────────┐
  │ AUTHORITY WITH   │  ◄──────────────►    │ ADVOCACY THROUGH │
  │                  │                      │                  │
  │ PARTICIPATION    │                      │     INQUIRY      │
  └──────────────────┘                      └──────────────────┘
              ┌──────────────────────────────────────┐
              │        ASSERTIVENESS WITH            │
              │                                      │
              │            RESPECT                   │
              └──────────────────────────────────────┘
```

Authority with participation refers to the manner in which a watch supervisor or senior controller interjects into the crews operational tempo and strategies. It requires the supervisor to be involved in the traffic pace continually, not randomly or when it is too late to adhere to the advice.

Advocacy through inquiry refers to obtaining all the variables before suggesting a course of action. This also requires constant attention to traffic operations. Prior to interjecting information be aware of the controller's intent. It may be a matter of controller technique, not adherence to safety.

Assertiveness with respect is a common sense approach to group dynamics and team building. It involves common sense and courtesy when addressing others, regardless of position and rank. It is important not to confuse assertiveness with rudeness.

Authority, advocacy, and assertiveness do not necessarily have to be used independently of each other. An effective controller will usually apply all three techniques simultaneously when dealing with other crewmembers. The key to utilization is knowing when to use which application and to what level is necessary. Some controllers require more time to see the big picture (inquiry) than others do. Many controllers that are in supervisory positions are not as receptive to interference as they should be, so it may be necessary to apply a little more assertiveness with respect than usual.

Don't delay airing uncertainties or anxieties due to being afraid of looking foolish or weak. Waiting until impact is inevitable is too late, and will result in administrative and punitive discipline. When opinions are voiced, give them fully and clearly, and expect the same in return. Don't become ego involved with individual points of view simply for personal gratification; deal in evidence and not prejudice. If a team decision has been made, accept it unless it contains some hazard not appreciated by other members of the team. Focus on what's right, not who's right.

You cannot afford to take situations or other crewmembers' participation for granted in the ATC environment. You must be conscious of the events occurring around you and not hesitate in letting other crewmembers know of situations concerning you. Regardless of your crew position or status, you have responsibilities to the success of the crew and the operations occurring during the shift.

> During a moderate traffic day at a Nielson AFB, Amn Smith was training in the local control position when an F-15 on a seven-mile final declared an emergency; smoke in the cockpit. The seasoned trainer immediately took command of the situation and started the appropriate coordination steps. The trainer became consumed with handling the emergency; the trainee was instructed to be an observer only.
> Having limited experience in a control tower, the trainee truly believes without a doubt that the trainer working the local control position knows about the F-16 previously put into position and hold waiting for release from departure control. The trainee also believes that the trainer certainly has a good reason for not taxiing the F-16 off the runway. The trainee thinks about questioning the decision, but remains mute. After all, the trainee doesn't want to disturb the trainer's concentration in getting the emergency aircraft on the ground.
> A minute later the trainer finally realized an F-16 was on the runway but it was too late and the emergency aircraft landed long over the top of the F-16. After the emergency landed the trainer and trainee reported to the chief controllers office waiting for the investigation. Disgusted, the trainer stated, "How could I have forgotten about that F-16 on the runway?" The trainee softly adds, "I was curious about that. I was wondering why you didn't taxi the F-16 off sooner or at least when ...?" (trainer) "You knew the F-16 was there?" (trainee) "Oh sure, but I thought you knew."
>
> **Fictitious**

Assuming the above scenario really happened, the trainer is understandably upset though little blame can be placed on the trainee. This is a direct result of crew resource utilization and group interaction lacking on the crew. A trend was probably established of overconfidence in trainer skills and under-confidence in the trainee's skills. The trainee's failure to speak up was a direct result of the trainers operating style and

the watch supervisor allowing the behavior. How is a trainee to function when told to always listen to the trainer, not to challenge the trainer when in position, and that it's the trainer's CTO on the line when in position?

REVIEW EXERCISE

1. In ATC, the effectiveness of the crew is totally dependent on the _____

_____
_____

2. Strong and effective _____ is at the heart of CRM.

3. The leadership trait that displays the mastery of ATC skills while inspiring confidence is

_____
_____

4. The leadership trait that displays a controllers ability to stick to tasks and see them through to

completion, regardless of difficulty, is
_____

5. When do conflicts over ATC procedures become destructive? _____

_____
_____

_____
_____

6. Developing a cohesive group of controllers where both leadership and followership are critical to

operational effectiveness is known as _____
_____

7. Assuming that a controller is proficient in every area of ATC due to past assignments is

an example of what hazardous attitude?
_____

8. Making an arbitrary decision to turn an aircraft a specific heading without weighing the consequences

of the control action is an example of what hazardous attitude?
_____

9. Focusing on a control error that was made over 20 minutes ago while the traffic flow continues to

move is an example of what hazardous attitude?
_____

10. The manner in which a watch supervisor interjects his/her opinions on how to control a particular

traffic scenario while not interfering with all operations is an example of _____

_____
_____

WORKLOAD MANAGEMENT

Introduction

With the advent of advanced automation (AWDS, FDS, CA, LA, MSAW, TCAS, STARS, ETVS, etc.) and increased operational demands, air traffic controllers are forced to assume many occupational roles such as resource manager, data analyst, counselor, arbitrator, and finally, a controller. Controllers must now analyze, integrate, and prioritize an overabundance of information in a very short period of time, while under extreme pressure and stress. Proper task prioritization increases situational awareness, and allows the controller to perform optimally in all settings. Prioritizing actions, distributing workload, and managing unexpected events are some elements involved in workload management.

Workload management forces controllers to think about their capabilities and the capabilities of other individuals in their working environment. Many are able to maintain a high level of proficiency in various operating positions during a variety of conditions (VFR/IFR/complex/night ops/etc.). This usually includes journeyman controllers whose primary duties are to control traffic and train. However, some personnel (watch supervisors and facility managers) may find themselves lacking the proficiency (currency) necessary to be truly effective in specific operating positions or during complex conditions.

Recognizing performance limitations decreases the potential danger of aircraft incidents and accidents while alerting the controller that proficiency or retraining in a particular position may be necessary. Contrary to the training a controller receives or human nature in general, it is vital that controllers admit and accept controlling limitations. Facility managers and supervisors must be alert to the abilities of each controller (to include themselves) and be proactive about position assignments during periods of intense workload. Controllers working in situations that exceed their operational capabilities violate moral and ethical reasoning because the likelihood of an aircraft mishap is increased, putting others—pilots and controllers alike—in jeopardy.

Workload management training assists controllers in prioritizing duties and responsibilities while in the control facility. By assessing the extent to which the watch supervisor and controller interact as a team, workload management training guides personnel on ways to avoid distractions from essential activities, distribute and manage workload, and avoid individual task overload. Errors relating to prioritizing actions and distributing workload account for many crew coordination errors since many aviation accidents and incidents occur during periods of high workload.

Causes of Poor Workload Management

The number one cause of incidents resulting from poor workload management is the failure to plan and rehearse for periods of high traffic during periods of lower traffic volume. Training must be continuous, not convenient. Those skills learned and applied during lesser traffic situations will surface as workload increases. Controllers must not be allowed to perform to a lesser degree when less traffic is available. Additionally, supervisory and management personnel should obtain proficiency during periods of moderate traffic or greater, not when flying is at a minimum. As a result, watch supervisors are forced to assign control responsibilities to individuals who may not be proficient enough to handle the workload using the adage, "if a controller is rated in the position, they should be able to handle any traffic situation."

Emergencies, equipment failures, and other unexpected events can place a burden on individual and crew workload capabilities. Weather and environmental abnormalities (unexpected IMC, reduced visibility) or even an evacuation to an alternate facility will invoke stress on a controllers prioritization and decision making capabilities. Though some situations can be rehearsed, success is often dependent on crew leadership and continuity.

Mission complexity (multi-ship departures/arrivals, tactical situations, IFR night mission) has a direct impact on workload management, especially when the mission is infrequent. Many facilities operate at minimal or moderate traffic levels the majority of the year with sudden bursts of complex operations. VFR pattern scenarios increase from one or two at a time to nine and ten, usually involving aircraft not assigned to the wing. Position responsibility must be assigned with traffic workload, equipment reliability, and training objectives in mind.

On a clear, winter day at Stiffel Approach, the facility CCTLR decided to compensate a crewmember by plugging into arrival control, allowing the WS to release the controller. Light traffic (one at a time) was scheduled, so the WS broke the crew down to an approach, approach assist, arrival, and final controller. The crew was very impressed to see the CCTLR working position during wing flying (first time). After one hour in position, the approach assist controller accepted a weather divert of 20 F-16 aircraft. The aircraft were immediately descended into approach control's airspace and sequenced, cleared, and handed off for non-standard approaches. The first four aircraft landed safely, as the second flight of four approached a three-mile final. The first aircraft of the second flight suddenly declared an emergency, hydraulic failure, and requested immediate landing. The CCTLR had no problem splitting up the remainder of the flight and performed adequately until the next flight of four reported an eight-mile final. The CCTLR attempted to split up the second flight while on final and soon found himself over-tasked with seven jets in the IFR arrival pattern and another flight of four passing a 15-mile final. The WS stepped in and redirected the fourth flight back to the approach controller for holding, but not before an airspace violation occurred with arrival. The CCTLR had seven airplanes sporadically spaced, many with less than minimum separation, located in both arrival and approach's airspace; coordination was not completed. Finally, the runway opened and the WS walked the CCTLR through the recovery scenario. All aircraft landed safely; no reports were filed or debrief conducted.

High Workload Scenario

The design of a control facility can have positive and negative effects on workload management. The design and location of control switches, ready reference files, and information retrieval equipment may be confusing or fragmented (not the same in each operating position). Controllers should be assured that each operating position has the necessary equipment and information to handle all situations. Facility locations often hamper a controller's ability to operate safely. Older control towers may have been encroached during the years, creating field of view limitations for the entire airfield. Design limitations should be directed to the facility manager to analyze and correct.

Crew rest and endurance is often over-looked during periods of decreased manning. Though military legend passes down that personnel are on duty 24-hours-a-day, controller effectiveness has been proven to decrease dramatically after only four hours. Regulations provide guidance on controller scheduling, and due to mission requirements, many facilities are operating 24 hours a day. This should not be an escape clause to allow personnel to work a continuous shift in one position. Workload management can often be

degraded by complacency. Controllers, watch supervisors, and facility managers should all be aware of the effects of sustained monitoring in the same environment.

Whatever can go wrong, will go wrong. Though many controllers live by Murphy's Law, the chances of it happening are slim in the highly controlled environment of ATC. This does not relieve personnel to be prepared for unannounced situations, and tailor workload management principles accordingly. Simple events such as ARTCC routing changes or issuing clearance changes just prior to takeoff or holding will occur practically everyday. Recognizing that events such as these can occur are vital parts of workload management training.

Recognizing Excessive Workloads

As workload increases, situational awareness decreases. When situational awareness lessens, a controller will find difficulty in achieving good performance. In order to survive in this environment, individuals naturally lower standards, first allowing minor errors which later leads to erratic performance (refer to previous example). These are indicators of a controller becoming overloaded. Minor errors could be, but are not limited to, difficulty with control instructions, uncertainty or indecision, loss of a normal scan pattern, fixation, temporal distortion (no sense of time or space), and difficulty in communicating. As minor errors compound, erratic performance such as mixing call signs, tuning out other controllers and supervisors, and breaking separation occurs.

Responding to Excessive Workloads

Controllers must work as a team in order to offset the effects of high task workloads. Some individuals can manage high workloads by delegating and prioritizing tasks (critical tasks first). For this process to be effective, other controllers must be receptive to taking on excess tasks from the operational controller. Additionally, controllers must be cognizant of each other to ensure critical separation parameters and standards are achieved. For this to be effective, controllers must verbalize intentions constantly throughout periods of high workload.

Tradition points to the watch supervisor as the facilitator in this process. All too often, line controllers will wait for supervisors to implement changes in workload assignments when crews should already have the skills to do so. This is completed through effective training during periods of light traffic, mentoring by seasoned controllers, and opinions derived from crew debriefs. Through pre-duty planning and clear communications with an assistant, coordinator, or watch supervisor, the ability to cope with uncertainties or sudden surges of traffic load will become more natural. The saying "prior planning prevents poor performance" illustrates the need to teach controllers how to anticipate and respond to increases in workload in the control facility.

Low Workloads

From a control facility perspective, low workload can be defined as periods of light traffic or during periods when manning exceeds operational needs. In the realm of CRM, low workload refers to the amount of duties and responsibilities an individual or crew can effectively handle during any given period. Conventional wisdom that operational precision increases as workload decreases is simply not true. Low workload breeds complacency and inattention.

The effect of low workloads on controllers can be entrapping. The feeling of being ahead or having nothing to do breeds day dreaming, drowsiness, lack of precision, and poor situational awareness. It usually occurs as a crew and not individually, inhibiting the ability to detect its ill effects. Refer to the scenario on the following page.

Responding to Periods of Low Workload

The ability to respond to complacency and periods of low workload lies more in the realm of being proactive than reactive. It relies on a combination of training and operations. Examples would be to rehearse or refine the next departure/arrival flow, recheck upcoming weather, or review emergency procedures, all of which keeps a controller's senses sharp and mind focused on ATC.

On a very slow Sunday at Melee AFB Tower, a Cessna 172 reported in at the designated VFR reporting point, VIPER, for an ILS approach to a full stop. The flight data controller verbally acknowledged the Cessna since the local controller was in the restroom at the time. Flight data informed the local controller when he returned to the tower cab. He simply nodded his head in response. When the Cessna reported in with it's request, the local controller responded with "ROGER, CLEARED APPROACH". While the Cessna was maneuvering for a six mile ILS final, a C-17 received short vectors from approach for a Tacan final to the same runway. Approach handed off the C-17 at approximately five miles from the end of the runway. Upon initial contact, Melee Tower cleared the C-17 for the option. Once turned on to final, the C-17 crew began scanning for traffic. At two-mile final, the C-17 pilot reported a C-172 straight ahead, approximately 500 feet, and 50 feet below their altitude. The pilot of the C-17 immediately banked right to avoid the C-172. During the avoidance maneuver, the local controller requested the position of the C-172, which was then passed to the C-17 after evasive action was taken. The local controller responded with, "mark the tapes".

Low Workload Scenario

It is very difficult to keep priorities in line when workload is low. This is compounded when distractions disturb the normal operational setting such as equipment alarms and lights, excessive vehicular radio traffic, or unnecessary conversations. A system of priority setting must be developed by the watch supervisor and consistently carried out by the crew. A system does not refer to an operating instruction or an official business referendum. It refers to the mannerisms or code of conduct that a crew displays 100 percent of the time. It is not effected during periods of low or high volume traffic, when senior personnel are in the control facility, or only when it is convenient. Setting operational priorities during periods of low workload requires buy-in by everyone on the crew and is useless if used only by individuals.

Mismanagement of workload and operational tasks results in degraded controller performance. *Critical tasks* require immediate attention. Procrastination will result in disaster (Example: The radar scope loses power while numerous aircraft are being controlled). *Important tasks* require prompt attention. Inattention could result in the task becoming critical (PIDP keyboard malfunctions just prior to a wing recovery). *Routine tasks* must be completed but have no serious impact. Numerous uncompleted routine tasks can create operational discomforts (FM nets go down or interfacility communications degrade).

The ability to react when operational tasks are degraded is a learned ability, usually gained by ample experience in a specific control setting. An individual will normally respond to a critical task during complex operations the same way they react during periods of less traffic. Control personnel cannot be expected to respond more effectively one time, when allowed to perform differently at other times. Air traffic controllers must be taught how to set operational priorities regardless of the traffic situation, with the same sense of urgency applied, dependent on the level of need.

Setting operational priorities is often a direct reflection of the crew's ability to utilize checklists. Well-developed checklists assist in training a controller how to prioritize by providing guidance on restoration priorities, and steps to regain operability. Refer to the following example to review some guidelines on setting operational priorities in the ATC operational setting.

Checklists – Consistently using well-developed checklists creates operational discipline. Use of operational checklists on seldom seen procedures channels a controller's attention.

Communication - Talk and interact. Silence allows the brain to stray from alertness.

Distractions – Ignore distractions. Allowing conversations or other events to distract a controller impedes prioritization. Supervisors should eliminate or lessen all distractions.

Delay Nonessential Tasks – Define essential and nonessential tasks. Prioritize nonessential tasks and perform them when time allows. Remember a controller's duty priority.

Delegate Tasks - Complete tasks using the entire crew during transitions from low to high workload. Do not force the transition onto one controller or operating position. Split combined positions, open a coordinator position, or allow more time to comply.

Critical Tasks – Remember what constitutes a critical task in ATC. Separating aircraft and issuing safety alerts must be handled first. Maintain precision when separating and sequencing – do not expand tolerances!

Setting Operational Priorities

REVIEW EXERCISE

1. List three elements involved in workload management.

_____
_____

_____
_____

_____
_____

2. Prioritizing duties and responsibilities while working in the approach control position is an example

of _____ _____.

3. What is the number one reason of poor workload management?

_____
_____

_____
_____

4. Referring to the *High Workload Scenario* example, how could the CCTLR have been better prepared

when the weather divert occurred?
_____

_____
_____

5. As _____ increases, _____ _____ decreases.

6. From a CRM perspective, low workload refers to what? _____

_____
_____

7. List three examples of being proactive during periods of low workload?

_____
_____

_____
_____

_____
_____

8. Referring to the *Low Workload Scenario* example, when did the first complacent ATC action occur,

causing the near miss incident? _____

_____
_____

9.   Tasks   that   when   accumulated   can   create   an   operational   discomfort   are   called
_____

_____
_____

RISK MANAGEMENT

*"A superior crewmember is one who stays out of trouble by using superior judgment
to avoid situations that might require the use of superior skill."*

Introduction

Napoleon once said the only resource the logistical wizards in his formidable army could not replenish was time, because "once lost, it is lost forever." Certainly, decisions made in today's dynamic ATC environment differ from those experienced in Napoleon's French infantry ranks, but the underlying principles of time and risk management in ATC decision-making are much the same. The ability to make a correct decision in a safe and timely manner depends on getting appropriate information quickly, accurately assessing the information, judging the probability of events, and assessing risk based on the three previous elements. This process must sometimes occur in seconds. Accident data suggests that most mishaps result from a series of poor decisions, known as the poor judgment chain. One erroneous decision increases the probability of another and as the poor judgment chain grows, time becomes the force that increases the probability of an accident.

Risk management is an orderly, progressive way of viewing a very complex situation. It helps individuals make appropriate decisions in order to accomplish the mission safely. Risk management is not limited to pre-duty planning or formal leadership positions. Although leaders (watch supervisors) are responsible and accountable for running their shifts and crews, safe mission accomplishment depends on individual crewmembers accepting responsibility for risks associated with threats to ATC at their particular level and operating position. An organization can only control traffic as safely and efficiently as possible when every individual crewmember makes proper decisions to manage risks as they occur during the shift.

Basic Components of Risk Management

Risk management can be defined as an assessment of the likelihood of an acceptable outcome to a given decision or judgment. The concept of risk management is inherent in ATC and encompasses the judgment portion of controller behavior. It involves critical thinking about what can and will go right or wrong, and what other control decisions should follow. Risk management is a continuous process in ATC. Traffic situations instantaneously disrupt the risk management cycle (see figure on next page), causing a controller to continuously begin the process over and over. Since a person's ability to make a judgment is based on a combination of practice, experience, and learning events, it is important to realize that more seasoned controllers usually make better decisions.

Eleven F-16 aircraft are conducting VFR pattern work simultaneously at Jellis AFB. An F-16 on downwind declares an emergency and tells the tower he is estimating high key in two minutes for holding and must have an immediate frequency change to talk the situation over with the Supervisor of Flying. Does the controller approve the F-16 to change frequency before realigning the traffic situation? What are the risks?

Identify the Risk

When a controller makes a decision, he or she follows a four-step process involving risk management assessment. The first thought in making the decision is identifying the threat or hazard. Questions will arise such as "What will happen if I say this?", and, "What could go wrong if this happens?" Depending if the decision is to be made by a group or the individual, the time to make this determination could take only a few seconds.

Once the threats have been identified, each has to be assessed. Though no formal risk assessment metric has been assigned to ATC decision making, for the purpose of this exercise, a go/no-go standard will suffice. To perform an adequate assessment of each risk, the controller must match the probability of the hazard occurring with the consequences of the mishap. As each risk is categorized, they will fall in rank order. The risk resulting in the lowest probability of hazard will usually be the appropriate choice.

A severe thunderstorm is inbound (identify the threat) from the west. Evaluate the consequences of the facility being struck by lighting or battered by winds (assess the threat).
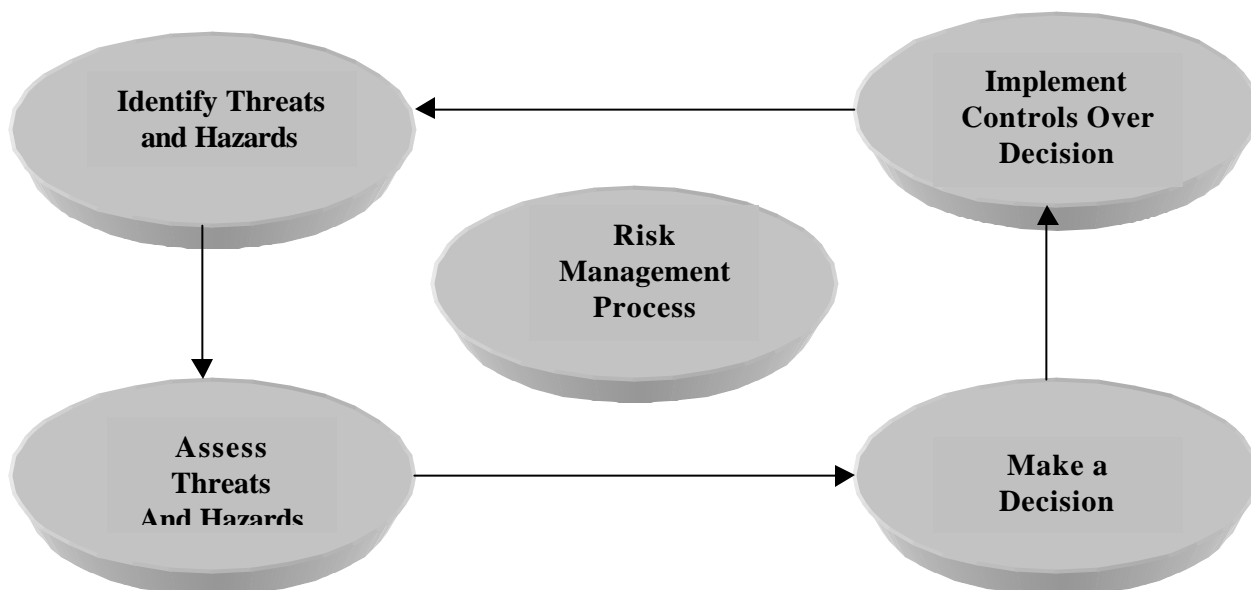
Risk	Consequence
Lost Communications	Delayed operations, alternate communications
Facility Evacuation	Divert operations, runway delays
Stay in Facility	Personnel injury, loss of life

Assess the Risk

Once all consequences have been analyzed, it becomes time to make a decision. What is the most appropriate choice for this activity? Variables such as time, urgency, attitude of senior leadership, and personal preference will guide the controller or team toward the specific choice necessary. It is imperative that all members in the decision making process are aware of the impending consequences in order to make further adjustments and decisions.

Identify Threats and Hazards → **Implement Controls Over Decision**

Risk Management Process

Assess Threats And Hazards → **Make a Decision**

The final step in risk management in decision making is the process of implementing controls over the situation. Steps and intermediate decisions can be made to mitigate the risks to some degree. For instance, not waiting till the last minute to respond to a situation. The best choices are made when more time is available to discuss or analyze the situation.

Decision Authority

The FAA and the USAF grant the air traffic controller the privilege of using public airspace, air navigation facilities, and entrust the lives of pilots to the control decisions made from that authority. In accepting this privilege, a controller is expected to adhere to specific rules and regulations without engaging in activities that might infringe on the rights and safety of others. The entire ATC crew has the responsibility to operate a facility safely and legally at all times. AFI 13-203, FAAO 7110.65, and the FARs grant crews authority for decision-making in the ATC environment.

The controller in position always has direct responsibility for the operation of the position, a responsibility not shared with anyone else except the watch supervisor who has the overall responsibility of the facility. When assigned an operating position, a controller is expected to use good judgment to understand and interpret the rules in individual situations and in the most responsible manner.

Group Decision-Making

The decision-making process integrates many of the basic elements of CRM. When arriving at a decision, it is important to effectively utilize all the resources available to the crew to achieve agreement - ensuring the team's effort is greater than the sum of the individual efforts. Synergy is easier to achieve in an environment of good communication and good leadership. By working together as a group, facilities can achieve an effect or reach a goal unobtainable by any one individual. Normally there is enough time to make a good decision, but there may not be enough time to recover from a bad decision.

The concepts of "team decision making" and "individual direct responsibility" are a paradox in the ATC career field. It is an accepted contradiction. There are no absolute divisions of responsibilities. The intent of the team concept is not to hold the team accountable for the action of individual members, in the event of an operational accident/incident. It is intended to bring together individuals, or positions, responsible for specific operations, in order to maximize operational effectiveness.

REVIEW QUESTIONS

1. A person's judgment is based on a combination of _____,
_____,

and _____ _____.

2. An orderly, progressive way of viewing a very complex situation is known as
_____

_____
_____

3. List the four steps involved in risk management.

_____
_____

_____
_____

_____
_____

_____
_____

4. The concept of _____ relays that the combined opinions of an entire air

traffic control crew is greater than the sum of each individual controller's opinion.

5. As the poor judgment chain grows, _____ becomes the force that increases

the probability of an aircraft accident.

6. What two agencies grant air traffic controllers the privilege of using public airspace, air navigation

facilities, and entrusts the lives of it's pilots to the control decisions made from that authority?

_____
_____

_____
_____

7. The _____ _____ _____ always has direct

responsibility for the operation of the position he/she is working in.

STRESS AWARENESS AND MANAGEMENT

Introduction

A controller's ability to perform is directly related to the physical and emotional state of the individual. A variation or demand in either state has a direct impact on a controller's judgment and decision making. Stress is the body's response to different demands placed on it. Responses can be interpreted in three ways: (1) Physical – the physical response to stressors such as heat, noise, and vibration; (2) Physiological – the response to stressors such as fatigue, lack of sleep, and missed meals; and (3) Emotional – the body's response to social or emotional stressors, such as peer pressure, marital problems, fear, and anger. The pressure resulting from stress may have adverse effects on individuals such as job dissatisfaction, reduced work effectiveness, behavior changes, or health problems. The human system is no longer able to cope and begins to break down.

Types of Stress

There are two major types of stress: physical and emotional. Of the two, emotional stress has the greatest impact in ATC; however, physical stress is also detrimental to performance.

Physical Stress

Physical stress usually occurs when a controller is exposed to prolonged discomfort, although some of the effects of emotional stress can also be physical. For example, if a controller continually allows static interference to simulcast with each transmission, hearing will soon be aggravated or impaired, and stress will almost certainly take over. The controller will become fatigued and may feel increasing tension in the neck or shoulder muscles.

Physical stress is most often brought on by environmental factors in the control facility. This is most likely to occur at the more critical and high workload phases of ATC such as heavy traffic periods, adverse weather conditions, equipment outages, and increased interaction between crewmembers, pilots, FAA controllers, ATC staff members, the list is inexhaustible. Bombardment from any combination of these factors over a period of time will tighten small muscle groups and capillaries resulting in headaches, muscle cramps, or hypertension.

Stress directly influences the body's ability to function under the various conditions encountered while controlling traffic. Though most of the effects are negative, there are ways to lessen short and long term consequences. The best cure for physical stress is prevention. Long-term prevention measures entails those actions a controller takes while off-duty and how the body is maintained on a continual basis. It includes the quality and quantity of food the body receives, sleep habits, exercise, and alcohol and drug use.

Short-term prevention actions are conducted while in the workplace and/or in position, and will lesson the effects of stress immediately. As the operational load increases or during emergency situations or equipment malfunctions, it is important for the controller to breathe. Breathing controls the oxygen flow into the bloodstream and various organs (to include the brain), and anything that reduces the ability of the lungs to transfer oxygen causes the body to function less than optimally. Increased breathing and respiration does not optimize oxygen flow, it hinders it. It is important to remember that a periodic, long

deep breath will keep the body in balance. Other short-term reminders that will reduce stress while in the workplace are rationing the amount of caffeine intake, monitoring the size of meals while on duty, and taking periodic breaks from the control position.

Emotional Stress

Emotions are an enormously powerful set of forces in human nature. They can take an individual from the heights of ecstasy to the depths of despair in a short period of time. Emotions are the guiding forces behind almost all human activity ranging from art and music to war. When controlling, emotions can have a tremendous influence on a controller's ability to perform well, particularly when it comes to issues of judgment. Emotional stressors include the social or emotional factors related to living and intellectual activities.

For most individuals, ATC tends to be an emotional experience. In the beginning of their aviation career, controllers feel a great deal of joy and exhilaration as well as fear as they control millions of dollars in resources and the fate of thousands of lives. Later they feel privileged or powerful for having the capability to control mass amounts of airplanes in a small space. Membership in an elite profession, such as ATC, is a rewarding experience usually making individuals feel very good about themselves.

When discussing emotional stress, it is important not to ignore the interaction between work and non-work factors. It is unrealistic to assume that controllers can leave their domestic problems at home. Individuals do not have the physical or emotional ability to suppress the effects of home-related stress while in the work environment. Likewise, frustrations at work will frequently influence the level of stress in the domestic environment.

At the same time, many controllers like to hide their emotions, almost as though acknowledging emotion makes them less capable or qualified. In reality, emotions are always present, influencing thinking and decision making. If a person ignores emotions, they may not recognize the major impact emotions have on an individual's ability to control safely.

ARE YOU FIT TO CONTROL?	
Illness?	Do I have any symptoms?
Medication?	Have I been taking prescription or over-the-counter drugs?
Stress?	Am I under psychological pressure from the job? Do I have money, health or family problems?
Alcohol?	Have I had anything to drink in the last 24 hours? Do I have a hang over?
Fatigue?	How much rest have I had since I worked last? Did I sleep well last night and am I adequately rested?
Eating?	Have I eaten enough of the proper foods to keep me adequately nourished during the entire shift?
I'm Safe	

Stages of Stress

The human body responds to demands made upon it in three stages. First, there is an alarm reaction; then resistance; and, finally, exhaustion (if the demand continues). This three-stage response is part of our primitive, biological coping mechanism. In the alarm stage, the body recognizes the stressor and prepares to deal with it through either confrontation or fleeing. The brain stimulates the sensory system, which increases the heartbeat, rate of breathing, and perspiration. Additionally, it raises the blood sugar, dilates the pupils, and slows digestion. A person may also experience a huge burst of energy, greater muscular strength, as well as improved hearing, vision, and alertness.

If fear is the predominant emotion, the body reacts by lowering the blood pressure, resulting in a pale face. This may be most memorable during the beginning months as a controller, for example, the first few times an individual is training in the local or approach position. A controller may also recall the effects of the body's alarm reaction, such as an increased heartbeat, sweaty palms, and breathlessness from the lowered blood pressure. The long-term effects of fear induced emotions are not harmful unless it is very severe and lasting.

If anger is the predominant emotion, the body reacts by raising the blood pressure, resulting in a red face. Anger is a dangerous emotion while controlling because the high blood pressure it triggers prevents the individual from thinking clearly and, thereby, lowers the controller's ability to develop a solution to the problem causing the alarm. The long-term effects of anger-induced emotions are dangerous because of the problems created by high blood pressure.

In the resistance stage, the body repairs any physical or mental damage caused by stressors. In some cases, the body adapts to stresses, such as extreme cold, hard physical labor, or worries. Fortunately, most physical and emotional stressors last for only a short duration, while the body simply copes with physiological stress.

If the stressor continues, the body will remain in the alarm stage in a constant state of readiness for a prolonged time. For example, if a controller's radar malfunctions during a proposed 3-hour recovery, the alarm may continue for hours (until the radar is operational). Eventually, the body may be unable to keep up with the demands, leading to the final stage of stress: exhaustion. With exhaustion, almost all control is lost as the mind is no longer able to keep a proper perspective. Sometimes, exhaustion can be so extreme that a controller may give up trying to solve a problem, and resign to fate. This can be a very dangerous situation in ATC.

Effects of Stress

It is important to realize that the process of making a simple decision is one of the leading causes of stress. Even the simple commitment to plugging into a position can be very stressful, whether or not there is pressure being exerted by other controllers. Except in extreme cases, stress has little impact on a person's ability to physically work in a control facility. It can, however, have a dramatic impact on complex tasks, such as scanning a radar scope or making logical decisions. A common effect of excessive stress is fixation or tunnel vision, where a controller will focus on one problem to the exclusion of others. A person loses the ability to see all the information in front of them, making it difficult or impossible to make sound choices from the available alternatives. As workload increases, stress makes it increasingly difficult for a controller to handle all demands.

Recognizing the Warning Signs

Although we all must deal with many types of stress, it is not an option to control traffic while under extreme stress as an air traffic controller. A controller is expected to handle all sources of stress, while performing in a sustained operations environment, or even when deployed. The cumulative effects of fatigue and stress are insidious and all control personnel must be aware of the signs controllers' exhibit when overstressed. Refer to the Life Events Stress Profile at the end of this section.

A common reaction to stress is the body and mind confusing 'priority' with 'race against time'. Since the primary duty of an air traffic controller is the safe and expeditious flow of traffic under their control, controllers often place priority on expeditious, which creates a stress situation in order to maintain safety. To minimize this source of stress, a controller must first learn to recognize personal warning signs, then take timely action to reduce its effects. The following exercise can help reveal whether an individual is suffering from the symptoms of stress overload.

STRESS OVERLOAD EXERCISE

Do you: Response

1)   rush your speech?   _____

2)   hurry or complete other people's sentences?   _____

3)   hurry when you eat?   _____

4)   hate to wait in line?   _____

5)   never seem to catch up?

                _____

6)   schedule more activities than you have time available?   _____

7)   detest wasting time?   _____

8)   drive too fast most of the time?   _____

9)   often try to do several things at once?   _____

10)   become impatient if others are too slow?   _____

11)   have little time for relaxation, intimacy, or enjoying your environment?   _____

If the answer was "yes" to most of the questions, chronic stress overload is a probability. This does not necessarily mean that there is a problem, because people handle stress as it relates to time differently. Most controllers go back and forth between being stressed by time and having a more relaxed schedule. Some individuals can and do live fast lives, because their bodies and mind can handle a faster pace.

Others learn to adjust to a faster pace. However, the chances of stress are greater in the fast lane, especially if individuals are not aware of its dangers or do little or nothing about the warning signs.

How does this exercise apply to ATC facilities? Supervisors and individual controllers must know their personal stress habits and those of other crewmembers. Emphasis should not be placed on being familiar with unrelated variables. It must be placed on how the crewmember performs while controlling aircraft. Understanding performance indicators that result from stress allows proactive decisions to be made as to position allocation and traffic workload. Performance indicators are numerous, although a few warning signs are evident when a controller is approaching an overstressing situation. Confusion, slowed reactions to controller inputs, irritability, and impaired judgments or decisions are indicators present when a controller is becoming overstressed. When these signs are recognized, actions need to be taken to correct them. Interact more with the individual, place them in a less busy control position, or allow them to take a complete break out of the facility. Allowing them to work through the situation for any reason is detrimental to the individual and to flying safety.

Managing Stress as a Controller

The most common applied means of individuals managing stress is through the use of alcohol and drugs. Alcohol/drug induced stress management practices are unsuitable as an air traffic controller and will negatively impact a person's ability to function optimally both physically and emotionally. It must be emphasized that the damage occurred from stress arises from the individual's response to it, rather than the stressor itself. It would be a perfect environment if everyone could simply avoid having to face situations that bring on stress. Generally speaking, every controller in the Air Force has to face stressful situations domestically and at work, and the remedy must rest with a modification of one's response to them.

In 1996, an ATC crew from Sands AFB went out for one drink after a swing shift to celebrate a STEP promotion of one of the crewmembers. The debrief had to be after this particular shift because of a major exercise beginning the next day that would last for at least 10 days. The watch supervisor bought the first round of drinks, everyone toasted to the promotion, and individuals began talking about the various personal, financial, and work problems plaguing them. Five hours and seven rounds later, the crew decided that it was time to go home and get some rest since two of the five controllers had second jobs to attend to the next day prior to duty, and had to get up in 3-hours. At the crew briefing the next day, the watch supervisor rewarded the new promotee (who drank more than the others the night before) by assigning him to the busiest control position in the facility to work the vast increase of exercise traffic. The two controllers just arriving from their second jobs were assigned less difficult positions, while the trainee was sent on a dinner run since no one had time to eat since the night prior. No incident occurred during this watch. The crew was so impressed with their performance that they decided to go out for one drink again that evening. The same behavior continued through the year.

Fictitious

Individuals will seldom talk about their stress related problems at work. Often, supervisors or coworkers discover that others have stress related problems through sessions after the duty day involving alcohol. Though the example above does not end in tragedy, or give specific stress indicators, it portrays many off-duty and pre-duty habits that compound the probability of chronic stress behavior, and how watch

supervisor decision making capability is skewed in response to the predicated habits. Specifically, alcohol was the stress reliever and a stress contributor.

Other off-duty activities can also act as a stress reliever and contributor. Squadron and community sporting events and higher educational pursuits are morale and welfare activities that enhance the lifestyle of those military members involved. They allow individuals to relieve stress encountered at home and at work. On the other hand, off-duty activities can also be a direct contributor of stress being displayed in the workplace. Personnel who are not allowed to participate in an event due to manning problems, increased traffic, or personal differences will develop some level of animosity that could effect crew effectiveness. The stress brought on by excess homework assignments and deadlines, or being defeated in a particular sporting event can directly effect an individual's control ability. Recognizing the signs of stress, no matter what the origin, is a responsibility of everyone on the crew.

Life Events Stress Profile

To enhance the awareness level and sources of stress in a controller's life, complete the Life Events Stress Profile questionnaire on the next page. Circle each event you have experienced in the last 12 months, and tally the Life Change Units (LCU) associated with each.

The more change a controller has in their life, the more stress will be experienced and the more likely a decline in health will occur. According to Trollip and Jensen (1991) of the individuals who reported LCUs totaling between 150 and 199, 37 percent had associated health changes within two years. Of those who had between 200 and 299, 51 percent reported health changes; and for those with over 300 LCUs, 79 percent had associated injuries and illnesses to report within a year of the life crisis.

Refer to the following guidelines to interpret the stress levels associated with specific LCUs:

Total Life Change Units	Stress Assessment/Risk Association
0-100	Little or no health risk; day to day stress confrontation
100-199	Minor risk of physical/emotional changes
200-299	Possible negative impact on health; stress management necessary
300-399	Probable health risk; lifestyle change necessary
400-	High health risk; medical referral may be necessary

LIFE EVENTS STRESS PROFILE	
LCU	**Life Event**
100	Death of a spouse
73	Divorce
65	Marital separation
63	Jail term
63	Death of close family member
53	Personal injury or illness
50	Marriage
47	Lost your job
45	Marital reconciliation
45	Retirement
44	Change in health of family member
40	Pregnancy
39	Sex difficulties
39	Gain of new family member
39	Business difficulties
38	Change in financial state
37	Death of a close friend
36	Change to a different line of work
35	Change in number of arguments with spouse or partner
31	Mortgage or loan over $30,000
30	Foreclosure of mortgage or loan
29	Change in responsibilities at work
29	Son or daughter leaving home
29	Trouble with in-laws or partner's family
28	Outstanding personal achievement
26	Spouse or partner begins or stops work
26	You begin or end work
25	Change in living conditions
24	Revision of personal habits
23	Trouble with boss or instructor
20	Change in work hours or conditions
20	Change in residence
20	Change in school or teaching institution
19	Change in recreational activities
19	Change in church activities
18	Change in social activities
17	Mortgage or loan less than $30,000
16	Change in sleeping habits
15	Change in number of family social events
15	Change in eating habits
13	Vacation
12	Christmas
11	Minor violations of the law

Total Life Change Units _____

REVIEW EXERCISE

1. Name three ways a body responds to the demands placed upon it?

_____
_____

_____
_____

_____
_____

2. When a controller is exposed to prolonged discomfort, he/she will usually experience _____

_____ stress at one point or another.

3. What is the best cure for physical stress?
_____

_____
_____

4. The type of stress that often includes social factors such as living conditions and educational level is

known as _____ stress.

5. List the three stages of stress and their individual effects on the body.

_____
_____

_____
_____

_____
_____

_____
_____

_____
_____

6. Referring to the *Stress Overload Exercise*, what factors can you change, and how, to reduce your

dependency on time?

_____

_____
_____

_____
_____

7. Additional duties, off duty education and sports, and alcohol use can be a stress _____

and a stress _____.

ANSWERS TO REVIEW EXERCISES

History of Crew Resource Management

1. Prevention of aviation accidents and incidents
2. 60-80 percent
3. Military Airlift Command (MAC)
4. Controller Awareness and Resource Training (CART)
5. Situational Awareness   Human Factors
   Effective Communications   Workload Management
   Mission Planning   Stress Awareness
   Group Dynamics   Decision Making
   Risk Management
6. AFI 11-290 – Cockpit/Crew Resource Management Training Program

Situational Awareness

1. Situational Awareness
2. Reorganizing and defining the nature of a problem encountered
3. Poor Judgment Chain
4. Channelized Attention
5. Pressing
6. Due to *channelized attention* on the KC-135 back taxiing, neither the LC nor the watch supervisor queried the FD controller for the T-38's exact position.
7. Complacency

Effective Communications

1. Feedback
2. 70 Percent
3. Individuals posses hidden agendas and intentionally withhold information
4. Physical
5. Pre-duty Briefing
6. Assertion
7. Watch Supervisor
8. Face-to-face, by Voice Media, Equipment Automation
9. False
10. Authoritarian

Group Dynamics

1. Strength of the individuals
2. Leadership
3. Competence
4. Perseverance
5. Issues from outside the control area are brought to disagreement
6. Team Building
7. Halo Effect
8. Impulsiveness
9. Emotional Jet Lag
10. Authority with Participation

Workload Management

1. Distributing Workload
   Managing Unexpected Events
   Prioritizing Actions
2. Workload Management
3. The failure to plan and rehearse for periods of high traffic during periods of low traffic volume
4. Obtained proficiency time during periods of moderate traffic or greater
5. Workload
   Situational Awareness
6. Amount of duties/responsibilities an individual/crew can effectively handle during any given period
7. Refine Departure/Arrival Flow
   Recheck Upcoming Weather
   Review Emergency Procedures
8. When the FD controller informed the LC of the Cessna operation informally
9. Routine Tasks

Risk Management

1. Practice
   Experience
   Learning Events
2. Risk Management
3. Identifying the Threats or Hazards
   Assess the Threats or Hazards
   Make a Decision
   Implement Controls Over the Decision
4. Synergy
5. Time
6. Federal Aviation Administration
   United States Air Force
7. Controller in Position

Stress Awareness and Management

1. Physical
   Physiological
   Emotional
2. Physical
3. Prevention
4. Emotional
5. Alarm Reaction – Brain stimulates the body to deal with event, increasing heartbeat, rate of breathing, and
   perspiration
   Resistance – Body repairs any physical or mental damage
   Exhaustion – Body is unable to keep up with demands and often gives up
6. No Right Answer
7. Reliever
   Contributor